[11-10-30-T7]

Solve linear equation

Procedure to solve linear equation

[1] Multiply both sides of the equation by the least common denominator of all fractions present. Remember that decimals are fractions with denominators of 10, 100, 1000, etc.

[2] Simplify both sides of the equation by removing parenthesis and combining like terms.

[3] Add or subtract from both sides of the equation as necessary to get all and only terms with the unknown on the same side of the equation.

[4] Multiply both sides of the equation by the reciprocal of the coefficient of the unknown.

■ Examples

EXAMPLE 1. Solve for the unknown y. $\frac{y}{3} + \frac{1}{2} = 3\,y + \frac{2}{5}$.

Multiply both sides by the least common denominator.

$$30\left(\frac{y}{3} + \frac{1}{2}\right) = 30\left(3\,y + \frac{2}{5}\right)$$

Simplify both sides of the equation by removing parenthesis and combining like terms.

$$10\,y + 15 = 90\,y + 12$$

Add or subtract from both sides of the equation as necessary to get all and only terms with the unknown on the same side of the equation.

$$3 = 80\,y$$

Multiply both sides of the equation by the reciprocal of the coefficient of the unknown.

$$y = \frac{3}{80}$$

EXAMPLE 2. Solve for the unknown y. $0.1\,y + .01 = 2.1\,y - .001$.

Multiply both sides by the least common denominator.

$$1000\,(0.1\,y + .01) = 1000\,(2.1\,y - .001)$$

Simplify both sides of the equation by removing parenthesis and combining like terms.

$$100\,y + 10 = 2100\,y - 1$$

Add or subtract from both sides of the equation as necessary to get all and only terms with the unknown on the same side of the equation.

$$-2000\,y = -11$$

Multiply both sides of the equation by the reciprocal of the coefficient of the unknown.

$$y = \frac{11}{2000} = 0.0055$$

EXAMPLE 2. Solve for the unknown y. $\frac{2}{3}\,(2\,x - 1) = x + \frac{1}{2}$.

Multiply both sides by the least common denominator.

$$\mathbf{6 \cdot \frac{2}{3}\,(2\,x - 1) = 6\left(x + \frac{1}{2}\right)} \qquad (1)$$

Simplify both sides of the equation by removing parenthesis and combining like terms.

$$4\,(2\,x - 1) = 6\,x + 3$$

$$8\,x - 4 = 6\,x + 3$$

Add or subtract from both sides of the equation as necessary to get all and only terms with the unknown on the same side of the equation.

$$2\,x = 7$$

Multiply both sides of the equation by the reciprocal of the coefficient of the unknown.

$$x = \frac{7}{2}$$

■ **Question.** Can you explain why in the equation (1) printed **bold** the parenthesis is necessary on the right hand side but unnecessary on the left hand side?

Following equation (1) two steps are used to simplify the equation. In complicated cases, several steps may be used. Do only as much in one step as you can comfortably manage. Even if you can comfortably manage many operations in one step, you should still include enough that a good student at your level would understand your work.